Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Soliphant M FTM50, FTM51, FTM52

Level limit switch
Universal vibration limit switch for fine-grained bulk solids, also for explosion-hazardous areas

Application
Soliphant M is a robust level limit switch for use in silos containing fine-grained or powdery solids even with a low bulk density.
The various designs mean the device has a wide range of applications. Certificates are also available for use in dust or gas incendive hazard areas.

FTM50 compact design for installation in any direction. A wide range of applications thanks to various variations; e.g.
short fork with stainless steel housing (F15);
standard fork with polyester housing (F16)

FTM51 with extension pipe up to 4 m for installation in any direction; e.g.
aluminium housing (T13) with separate connection compartment EEx de

FTM52 with rope up to 20 m for installation from above; e.g. with aluminium housing (F17)

Typical applications: cereals, flour, powdered milk, cocoa, sugar, animal feed,
detergents, dye powder, chalk, gypsum, cement, sand, plastic granules

Your benefits

- Market leader in the area of level detection of bulk solids with practical experience since 1967
- No calibration: easy commissioning (plug and play)
- No mechanically moving parts: no wear, long operating life
- Insensitive to external vibrations and build-up: maintenance-free operation, independent of bulk solids
- Switching status display through cover with sight glass: easy monitoring
- Various electronic inserts: e.g. NAMUR, relay, thyristor and PFM-signal outputs for optimum alignment with the plant control system
- New: also with short fork (100 mm fork length)
- New: build-up and abrasion display selectable
- New: density setting and switching delay selectable

TI392F/00/en

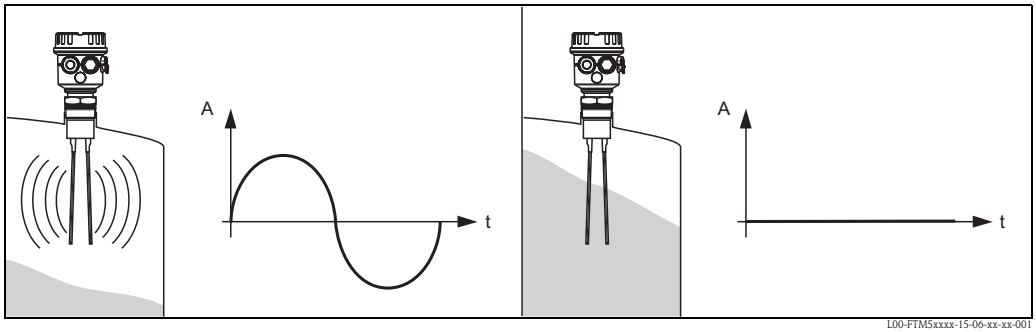
Endress+Hauser
People for Process Automation

Table of contents

Function and system design

Measuring principle

A piezoelectric drive excites the tuning fork of Soliphant M FTM50, FTM51 and FTM52 to its resonance frequency. If medium covers the tuning fork, the fork's vibrating amplitude changes (the vibration is damped). Soliphant M's electronics compare the actual amplitude with a target value and indicates whether the tuning fork is vibrating freely or whether it is covered by medium.

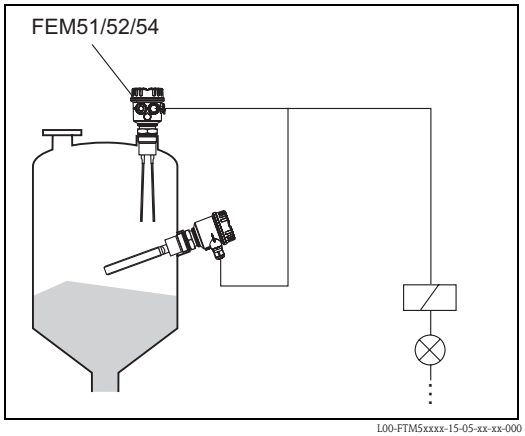


A = amplitude

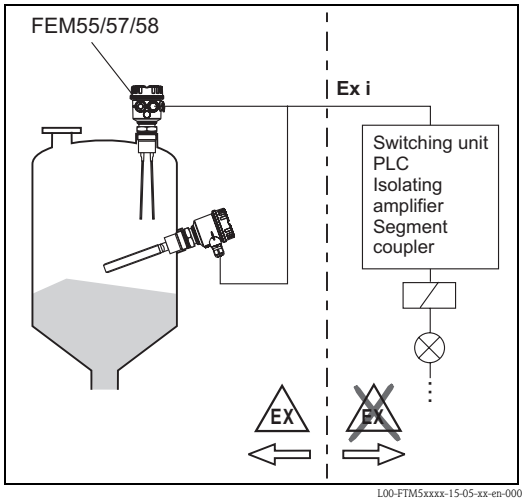
Measuring system

The components of the measuring system depend on the electronic insert selected.

Level limit switch
Soliphant M FTM with electronic versions
FEM51, FEM52, FEM54



Level sensor
Soliphant M FTM with electronic versions
FEM55, FEM57, FEM58
for connecting to a separate switching unit
or an isolating amplifier
e.g. Nivotester FTL325N, FTL375N (NAMUR)
or FTL325P, FTL375P (PFM)



Electronic versions for level limit switch

FEM51:
Two-wire AC version;
Switch the load directly into the power supply circuit via the thyristor.

FEM52:
Three-wire DC version;
Switch the load via the transistor (PNP) and separate connection.

FEM54:
Universal current version with relay output;
Switch the loads via 2 floating change-over contacts (DPDT).

Electronic versions for level sensor

FEM55:
For separate switching unit; signal transmission 8/16 mA along two-wire cabling.

FEM57:
For separate switching unit; PFM signal transmission;
Current pulses superposed on the power supply along the two-wire cabling.
Self test from the switching unit without changing levels.

FEM58:
For separate switching unit; signal transmission H-L edge 2.2…4.0 / 0.4…1.0 mA
to EN 50227 (NAMUR) along two-wire cabling.
Checking of connecting cabling and other devices by pressing a button on the electronic insert.

Cable specifications

Use a shielded cable in the event of strong electromagnetic radiation.

Immunity to temperature change of connecting cable
The connecting cables must withstand the ambient temperature +15 K.

Connecting cables

- Electronic inserts: cross-section max. 2.5 mm^2; strand in ferrule to DIN 46228
- Protective earth in housing: cross-section max. 2.5 mm^2
- Equipotential bonding connection on housing: cross-section max. 4 mm^2

Cable entry

Housing-specific; Phoenix screw terminal on electronic insert

Input

Measured variable

Level (according to the mounting location and the overall length)

Measuring range (detection range)

- FTM50: overall length see page 19
- FTM51: overall length 300... 4000 mm
- FTM52: overall length 750...20000 mm

The measuring range of Soliphant M depends on the medium, mounting location and fork length.
The detection range is located within the length of the fork.

One can distinguish between

- standard fork with a length of 155 mm (≥ 10 g/l) and
- short fork with a length of 100 mm (≥ 50 g/l)

Input signal

Probes covered => small vibrating amplitude
Probes not covered => large vibrating amplitude

Selectable frequency monitoring (diagnosis) for detection of abrasion and build-up

Measuring frequency

- standard fork: approx. 140 Hz
- short fork: approx. 350 Hz

Output

Galvanic isolation

FEM51, FEM52, FEM55:
Between sensor and power supply

FEM54:
Between sensor, power supply and load

FEM57, FEM58:
See switching unit connected

Switch behaviour

Binary

Power-on behaviour

When switching on the power supply the output is set to "signal on alarm".
After a maximum of 3 s it switches to the correct output signal.

Fail-safe mode

Minimum/maximum residual current safety selectable on electronic insert.
(with FEM57 only at Nivotester)

MAX = maximum safety:
The output switches safety-oriented when the fork is covered (signal on alarm)
For use with overfill protection for example

MIN = minimum safety:
The output switches safety-oriented when the fork is uncovered (signal on alarm)
For use with running empty protection for example

Switching delay

0.5 s when the sensor is covered
1.5 s when the sensor is uncovered (1.0 s for short fork)

Can be changed to 5 s for covering and uncovering.

Ex specifications

FEM51, FEM52, FEM54, FEM55:

– Explosion protection for explosive gas-air mixtures:
  Ex d, Ex de, XP, intrinsically safe sensor circuit Ex ia, IS
– Explosion protection for explosive dust-air mixtures:
  Dust-Ex, DIP

FEM57, FEM58:

– Explosion protection for explosive gas-air mixtures:
  Ex ia, IS (Intrinsically safe power supply + intrinsically safe sensor circuit)
– Explosion protection for explosive dust-air mixtures:
  Ex iaD, IS (Intrinsically safe power supply + intrinsically safe sensor circuit)

FEM51 electronic insert (AC 2-wire)

Power supply

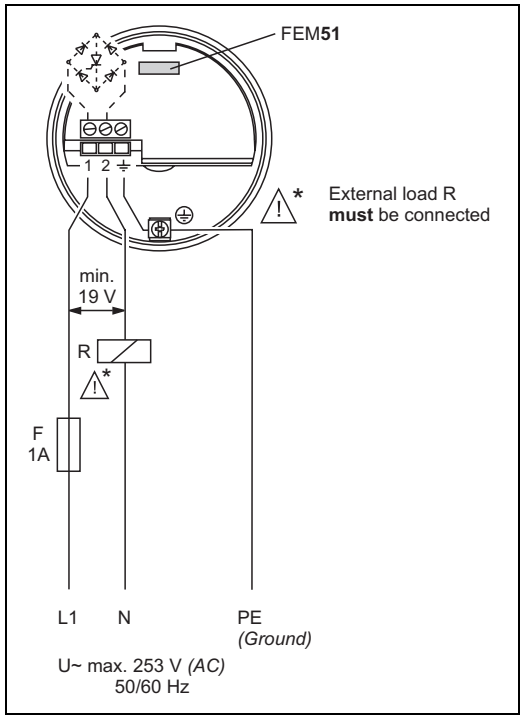
Supply voltage: 19...253 V AC
Power consumption: < 1.0 W
Residual current consumption (I_R): < 4 mA; 5.5 mA for short fork (in switch-off moment < 1 mA for 100 ms)
Short-circuit protection
Separation voltage: 3.7 kV
FEM51 overvoltage protection: overvoltage category III

Electrical connection

Two-wire AC connection

Always connect in series with a load!

Check the following:
- the residual current consumption in blocked state
- that for low voltage
  - the voltage drop across the load is such that the minimum terminal voltage at the electronic insert (19 V) when blocked is not undershot.
  - the voltage drop across the electronics when switched through is observed (up to 12 V)
- that a relay cannot de-energise with holding power below 1 mA.
  If this is the case, a resistor should be connected parallel to the relay (RC module available on request).
- When selecting the relay, pay attention to the holding power / rated power
  (See below "Connectable load")



L00-FTM5xxxx-04-05-xx-en-004

Output signal

I_L = load current (switched through)

I_R = residual current (blocked)

☼ = lit

◔ = flashes

● = unlit

L00-FTL5xxxx-07-05-xx-xx-000

* See also "Operating elements" on Page 22.

Safety mode	Level	Output signal	LEDs green	yellow	red
MAX		1 —I_L→ 2	☼	☼	●
		1 - -I_R- -→ 2	☼	●	●
MIN		1 —I_L→ 2	☼	☼	●
		1 - -I_R- -→ 2	☼	●	●
Maintenance required *		1 - -I_L / I_R- -→ 2	◔		◔
Instrument failure		1 - -I_R- -→ 2	●	●	☼

L00-FTM5xxxx-04-05-xx-en-001

Signal on alarm

Output signal on power failure or in the event of device failure: I_R

Connectable load

- For relays with a minimum holding power/rated power > 2.5 VA at 253 V (10 mA) or > 0.5 VA at 24 V (20 mA)
- Relays with a lower holding power/rated power can be operated by means of an RC module connected in parallel
- For relays with a maximum holding power/rated power < 89 VA at 253 V or 8.4 VA at 24 V
- Voltage drop across FEM51 max. 12 V
- Residual current with blocked thyristor max. 4 mA (5.5 mA for short fork)
- Load current max. 350 mA (short-circuit proof)

FEM52 electronic insert (DC PNP)

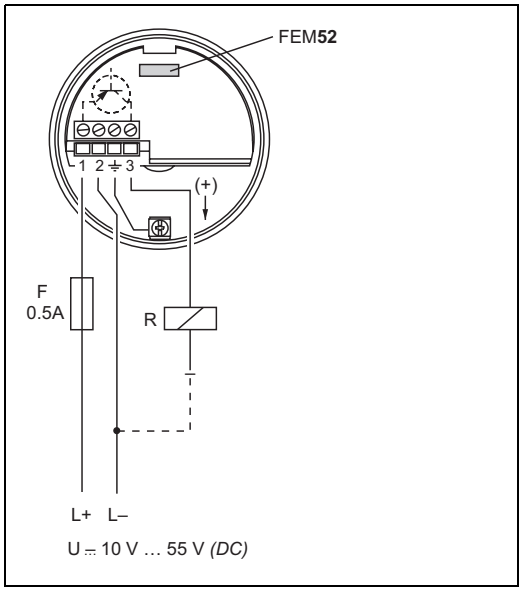
Power supply

DC voltage: 10 V…55 V
Ripple: max. 1.7 V, 0…400 Hz
Current consumption: max. 16 mA
Power consumption: max. 0.86 W
Reverse polarity protection
Separation voltage: 3.7 kV
FEM52 overvoltage protection: overvoltage category III

Electrical connection

Three-wire DC connection

Preferably used with programmable logic controllers (PLC), DI module as per EN 61131-2.
Positive signal at switching output of the electronics (PNP).



L00-FTM5xxxx-04-05-xx-xx-007

Output signal

I_L = load current (switched through)

I_R = residual current (blocked)

☼ = lit

◐ = flashes

● = unlit

L00-FTL5xxxx-07-05-xx-xx-000

* See also "Operating elements" on Page 22.

Safety mode	Level	Output signal	LEDs green	yellow	red
MAX		L+ 1 —I_L→ + 3	☼	☼	●
		1 - -I_R- -→ 3	☼	●	●
MIN		L+ 1 —I_L→ + 3	☼	☼	●
		1 - -I_R- -→ 3	☼	●	●
Maintenance required *		1 - -I_L / I_R- -→ 3	☼		◐
Instrument failure		1 - -I_R- -→ 3	☼	●	☼

L00-FTM5xxxx-04-05-xx-en-007

Signal on alarm

Output signal on power failure or in the event of device failure: < 100 µA

Connectable load

- Load switched via transistor and separate PNP connection, max. 55 V
- Load current max. 350 mA (cyclical overload and short-circuit protection)
- Residual current < 100 µA (with transistor blocked)
- Capacitive load max. 0.5 µF at 55 V, max. 1.0 µF at 24 V
- Residual voltage < 3 V (for transistor switched through)

FEM54 electronic insert (AC/DC with relay output)

Power supply

Alternating voltage 19 V…253 V, 50/60 Hz or DC voltage: 19 V…55 V
Power consumption: max. 1.5 W
Reverse polarity protection
Separation voltage: 3.7 kV
FEM54 overvoltage protection: overvoltage category III

Electrical connection

Universal current connection with relay output (DPDT)

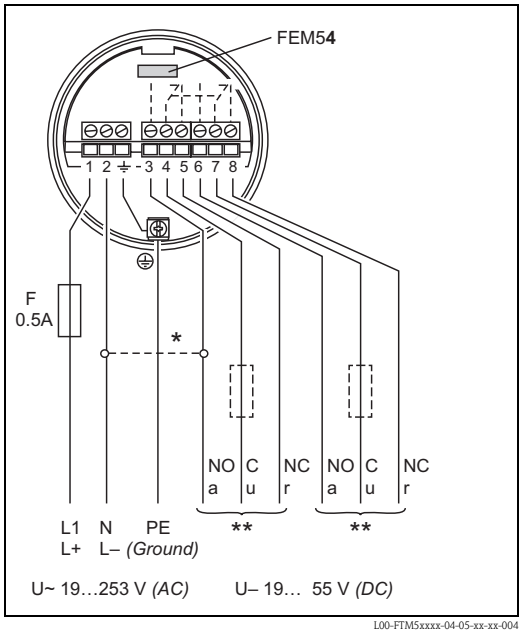
Power supply:
Please note the different voltage ranges for AC and DC.

Output:
When connecting an instrument with high inductance, provide a spark arrester to protect the relay contact.
A fine-wire fuse (depending on the load connected) protects the relay contact on short-circuiting.
Both relay contacts switch simultaneously.

* When jumpered, the relay output works with NPN logic.

** See below "Connectable load"

Note!
Please note the different voltage ranges for AC and DC.



L00-FTM5xxxx-04-05-xx-xx-004

Output signal

= relay energised
= relay de-energised
= lit
= flashes
= unlit

L00-FTL5xxxx-07-05-xx-xx-001

* See also "Operating elements" on Page 22.

Safety mode	Level	Output signal	LEDs green	LEDs yellow	LEDs red
MAX		3 4 5 6 7 8	☼	☼	●
		3 4 5 6 7 8	☼	●	●
MIN		3 4 5 6 7 8	☼	☼	●
		3 4 5 6 7 8	☼	●	●
Maintenance required *			☼		◔
Instrument failure		3 4 5 6 7 8	☼	●	☼

L00-FTM5xxxx-04-05-xx-en-008

Signal on alarm

Output signal on power failure or in the event of device failure: relay de-energised

Connectable load

- Loads switched via 2 floating change-over contacts (DPDT)
- I~ max. 6 A (EEx de 4 A), U~ max. 253 V; P~ max. 1500 VA, cos φ = 1, P~ max. 750 VA, cos φ > 0.7
- I- max. 6 A (EEx de 4 A) to 30 V, I- max. 0.2 A to 125 V
- The following applies when connecting a functional low-voltage circuit with double isolation as per IEC 1010: Sum of voltages of relay output and power supply max. 300 V

FEM55 electronic insert (8/16 mA H-L edge)

Power supply

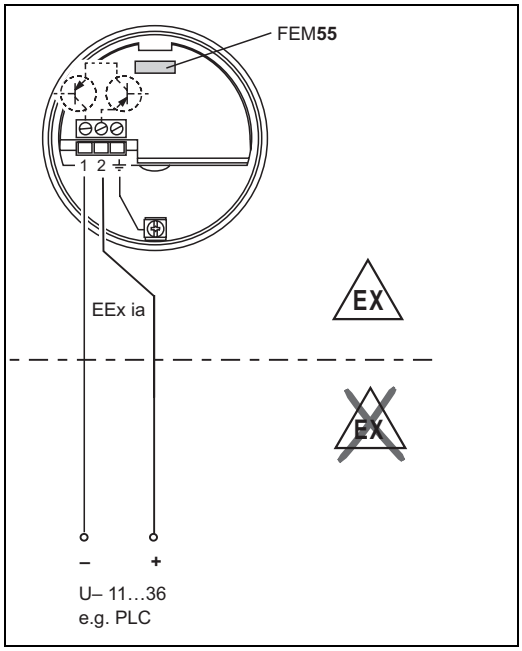
Supply voltage: 11...36 VDC
Power consumption: < 600 mW
Reverse polarity protection
Separation voltage: 3.7 kV
FEM55 overvoltage protection: overvoltage category III

Electrical connection

Two-wire connection for separate switching unit

For connecting to programmable logic controllers (PLC) for example,
AI module 4-20 mA to EN 61131-2.
Output signal jump from high to low current on limit.

(H-L edge)



L00-FTM5xxxx-04-05-xx-en-000

Output signal

~ 16 mA = 16 mA ± 5 %

~ 8 mA = 8 mA ± 6 %

= lit

= flashes

= unlit

L00-FTL5xxxx-07-05-xx-xx-000

* See also "Operating elements" on Page 22.

Safety mode	Level	Output signal	LEDs green	yellow	red
MAX		+ 2 ~16 mA 1	☼	☼	●
		+ 2 ~8 mA 1	☼	●	●
MIN		+ 2 ~16 mA 1	☼	☼	●
		+ 2 ~8 mA 1	☼	●	●
Maintenance required *		+ 2 8/16 mA 1	◪		◪
		3.6 mA	◪	●	◪
Instrument failure		+ 2 3.6 mA 1	●	●	☼

L00-FTM5xxxx-04-05-xx-en-006

Signal on alarm

Output signal on power failure or in the event of device failure: < 3.6 mA

Connectable load

- R = (U - 11 V) / 16.8 mA
- U = connection DC voltage 11 V…36 V

FEM58 electronic insert (NAMUR H-L edge)

Note!
Only in combination with standard fork (fork length 155 mm).

Power supply

Power consumption: < 6 mW at I < 1 mA; < 38 mW at I = 2.2...4 mA
Separation voltage: 0.5 kV
Connection data interface: IEC 60947-5-6

Electrical connection

Two-wire connection for separate switching unit

For connecting to isolating amplifiers
acc. to NAMUR (IEC 60947-5-6),
e.g. FTL325N, FTL375N from Endress+Hauser.

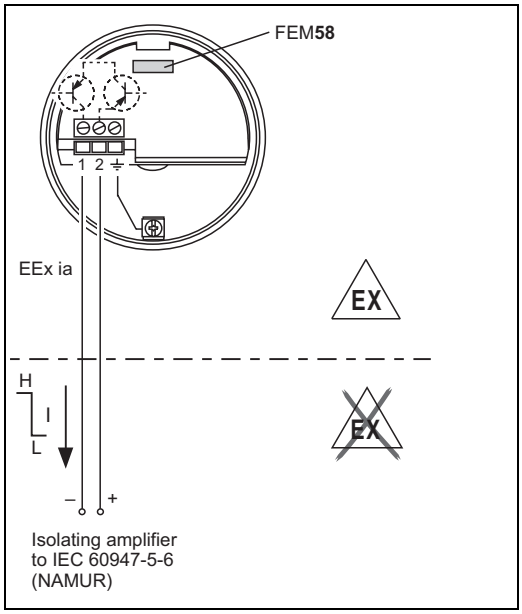
Output signal jump from high to low current
on limit.

(H-L edge)

Additional function:
Test button on the electronic insert.
Pressing the button breaks the connection
to the isolating amplifier.

Note!
For Ex-d applications, the additional function
can only be used if the housing is not exposed
to an explosive atmosphere.

Note!
Connecting to multiplexer:
Set clock time to min. 5 s.



L00-FTM5xxxx-04-05-xx-en-005

Output signal

= lit
= flashes
= unlit

L00-FTL5xxxx-07-05-xx-xx-000

* See also "Operating elements" on Page 22.

Safety mode	Level	Output signal	LEDs green	yellow	red
MAX		+ 2 → 1 : 2.2 … 4.0 mA	☼	☼	●
		+ 2 → 1 : 0.4 … 1.0 mA	☼	●	●
MIN		+ 2 → 1 : 2.2 … 4.0 mA	☼	☼	●
		+ 2 → 1 : 0.4 … 1.0 mA	☼	●	●
Maintenance required *		+ 2 → 1 : 0.4 … 4.0 mA	☼		☼
Instrument failure		+ 2 → 1 : 0.4 … 1.0 mA	●	●	☼

L00-FTM5xxxx-04-05-xx-en-012

Signal on alarm

Output signal in event of device failure: < 1.0 mA

Connectable load

- See Technical Data of isolating amplifier connected according to IEC 60947-5-6 (NAMUR)
- Connection also to isolating amplifier with safety engineering (I = 3...4.8 mA)

FEM57 electronic insert (PFM)

Power supply

Supply voltage: 9.5...12.5 VDC
Power consumption: < 150 mW
Reverse polarity protection
Current consumption: 10...13 mA
Separation voltage: 0.5 kV

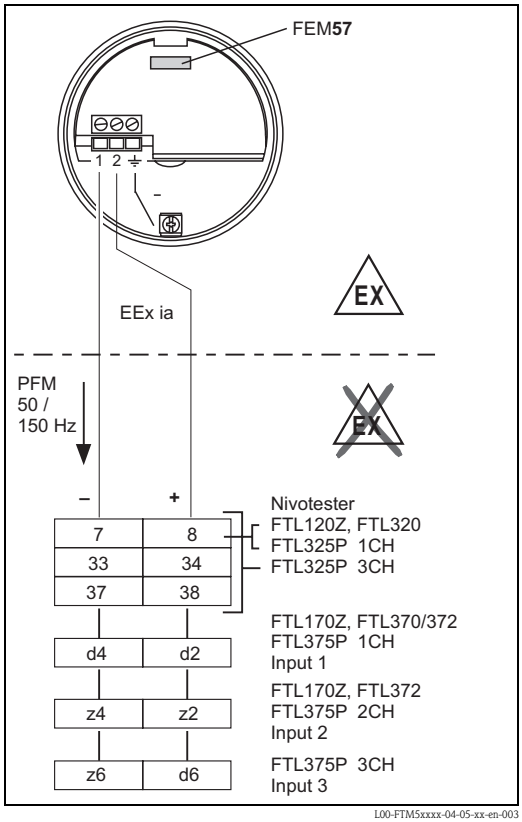
Electrical connection

Two-wire connection for separate switching unit

For connecting to switching units
Nivotester FTL120Z, FTL170Z, FTL320,
FTL325P, FTL370, FTL372, FTL375P
from Endress+Hauser.
Output signal jump of PFM signal from high to low frequency when sensor is covered.
Switching between minimum/maximum safety in the Nivotester.

Additional function "self test":
After interruption of the power supply, a test cycle is activated which checks the sensor and electronics without any change in level.
For this purpose, the operating elements must be configured as follows.

The test is activated and monitored at the switching unit.



L00-FTM5xxxx-04-05-xx-en-003

Output signal

☼ = lit
◪ = flashes
● = unlit

L00-FTL5xxxx-07-05-xx-xx-000

* See also "Operating elements" on Page 22

Safety mode	Level	Output signal (PFM)	LEDs green	yellow	red
		150 Hz	☼	☼	●
		50 Hz	☼	●	●
Maintenance required *		150 Hz	☼	☼	◪
		0 Hz	☼	●	◪
Instrument failure		0 Hz	☼	●	☼

L00-FTM5xxxx-04-05-xx-en-009

Signal on alarm

Output signal on power failure or in the event of device failure: 0 Hz

Connectable load

- Floating relay contacts in connected switching unit Nivotester FTL120Z, FTL170Z, FTL320, FTL325P, FTL370, FTL372 or FTL375P.
- For contact load see the Technical Data of the switching unit.

Operating conditions

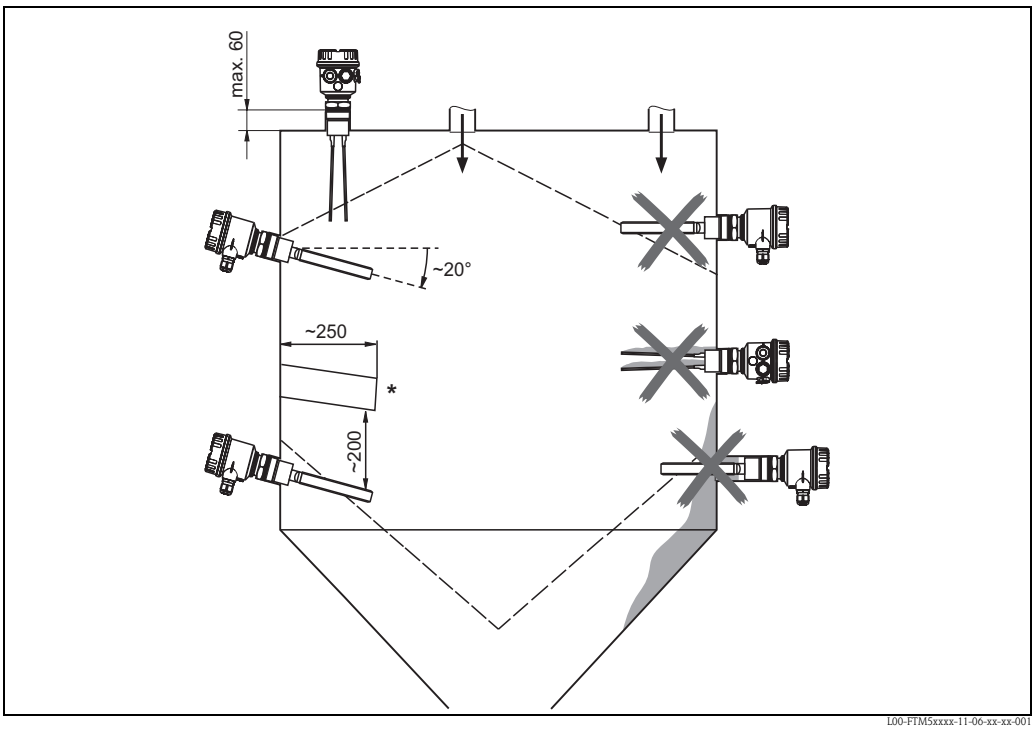
Note!
All dimensions in mm! (100 mm = 3.94 in)

Installation instructions

Mounting location

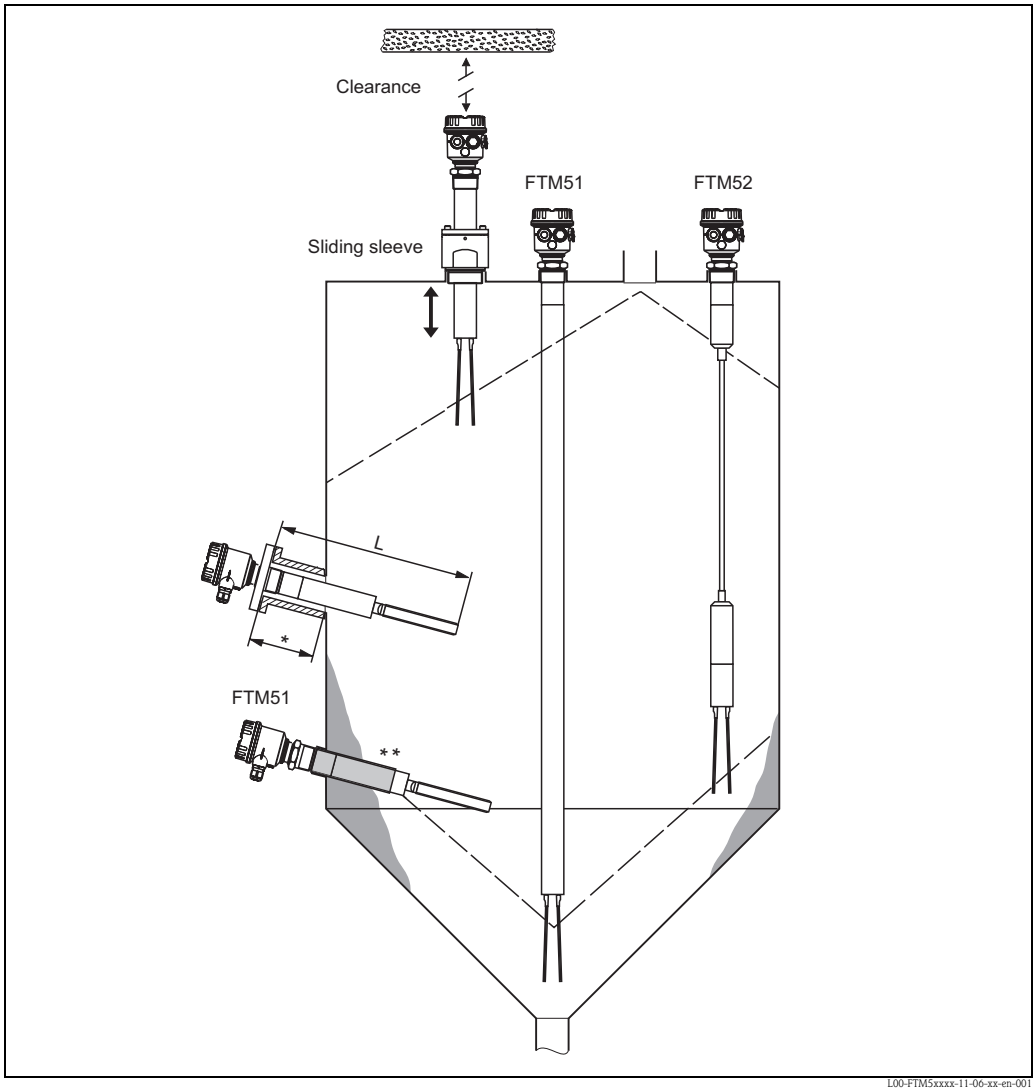
e.g. storage or buffer container

Orientation FTM50



Horizontal installation / Vertical installation
** Protective cover (to be provided by customer)*

Orientation FTM51, FTM52



Horizontal installation / Vertical installation
** Nozzle length: max. L - 145 mm for short fork or L - 200 mm for standard fork*
*** Supporting tube (to be provided by customer)*

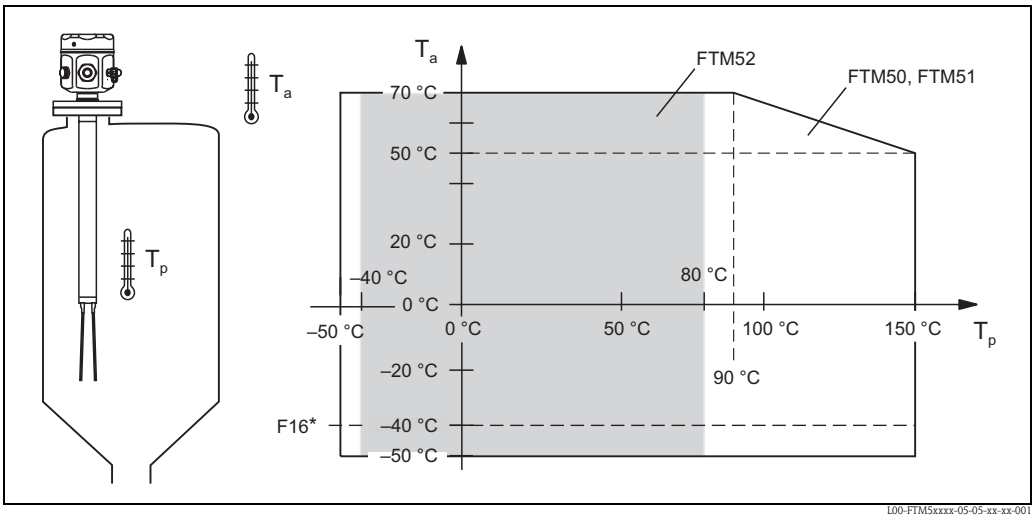
Environment

Ambient temperature range	-50...+70 °C (-40...+70 °C with F16 housing)
Storage temperature	-50...+85 °C
Climate class	Climatic protection as per DIN IEC 68 Part 2-38, Fig. 2a
Degree of protection	IP66/IP67 (housing F15, F16, F17), NEMA4X IP66/IP68 (housing F13, T13), NEMA4X, NEMA6P
Vibration resistance	DIN 60068-2-27 / IEC 68-2-27: shock 30 g; vibration 0.01 g^2/Hz
Electrical safety	IEC 61010, CSA 1010.1-92, FM3600
Electromagnetic compatibility	Interference emission to EN 61326, Electrical equipment Class B, Interference immunity to EN 61326, Annex A (Industrial)

Process

Medium temperature limits

Permitted ambient temperature T_a at housing depending on the process temperature T_p in the container:



x °C = (1.8 x + 32) °F

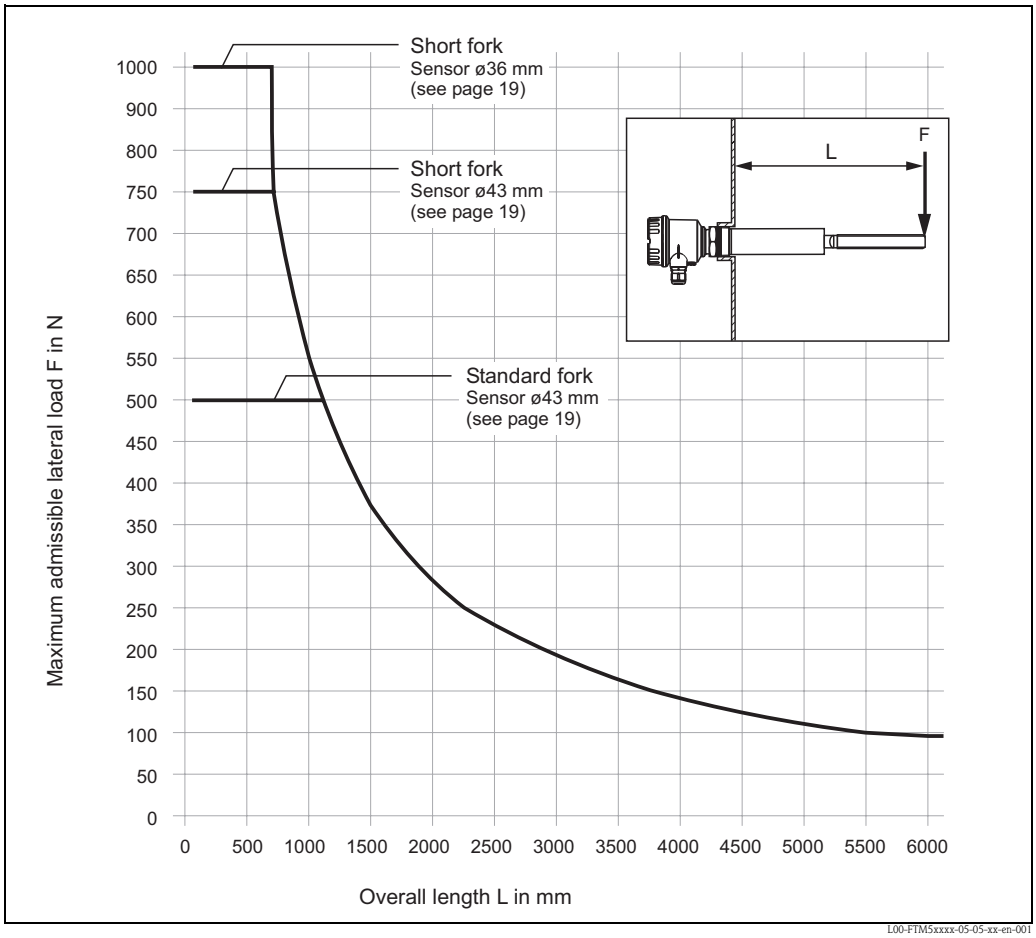
** Restriction on –40 °C with F16 housing*

Thermal shock resistance	Maximum 120 K
Limiting medium pressure range	-1...25 bar **Maximum Working Pressure (MWP)** FTM50/51: 25 bar FTM52: 2 bar (6 bar for EEx d and EEx de) **Burst pressure** FTM50/51: 100 bar
State of aggregation	Solids
Grain size	≤ 10 mm

Bulk density

≥ 10 g/l (standard fork)
≥ 50 g/l (short fork)

Lateral load (static)



100 mm = 3.94 in

Tensile strength rope FTM52

3000 N

Mechanical construction

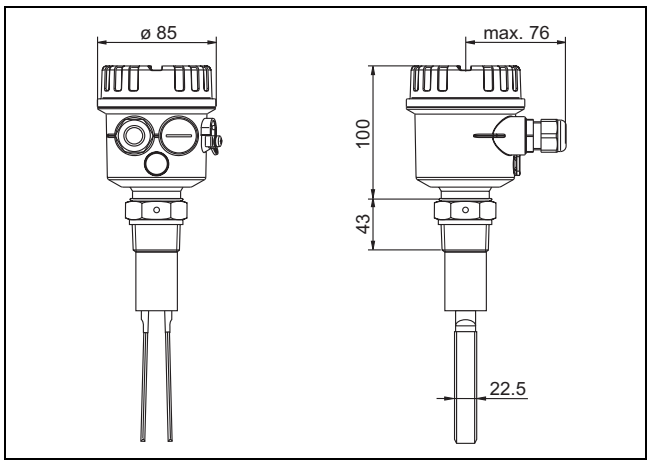
Note!
All dimensions in mm! (100 mm = 3.94 in)

Design, dimensions

Housing and process connection

Polyester housing (F16)

Process connection:
R 1½
NPT 1½
NPT 1¼

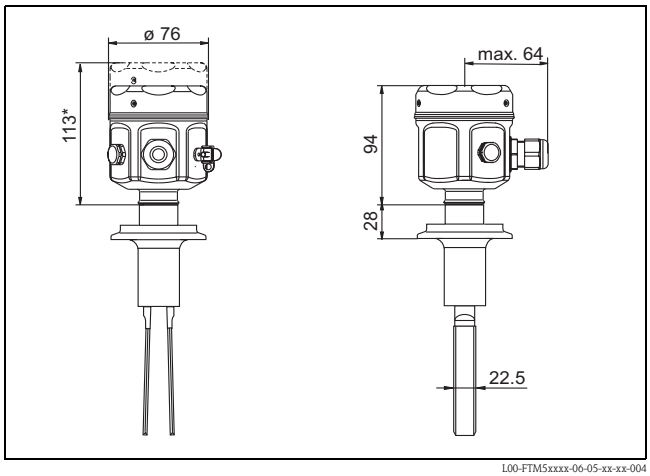


L00-FTM5xxxx-06-05-xx-xx-003

Stainless steel housing (F15)

Process connection:
Tri-Clamp

* Stainless steel cover with glass insert

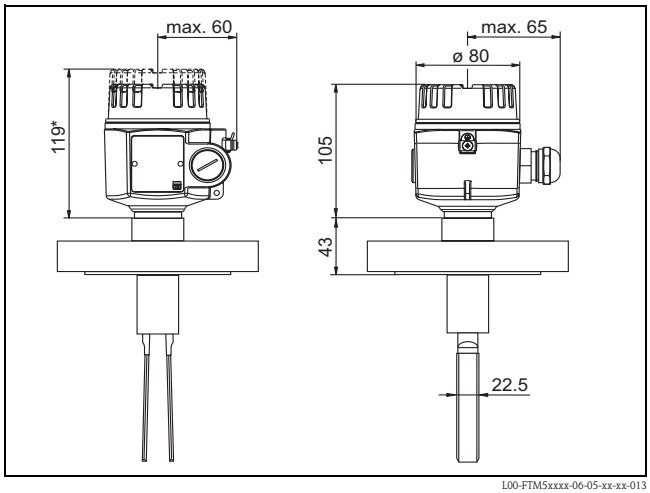


L00-FTM5xxxx-06-05-xx-xx-004

Aluminium housing (F17)

Process connection:
Flange

* Aluminium cover with glass insert

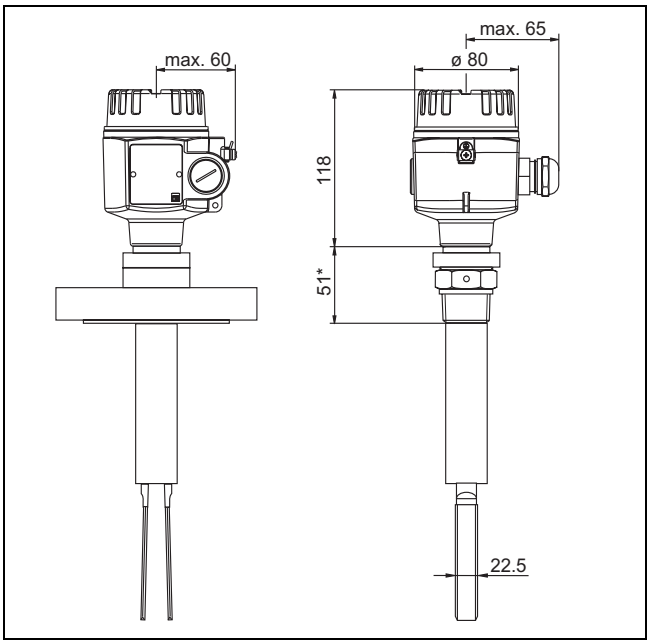


L00-FTM5xxxx-06-05-xx-xx-013

Aluminium housing (F13)

Process connection:
For EEx d for FTM51 and FTM52

* For Tri-Clamp 36 mm



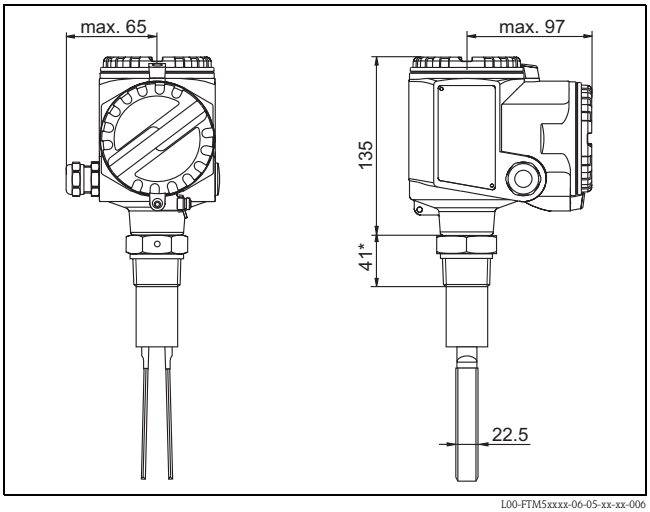
L00-FTM5xxxx-06-05-xx-xx-005

Aluminium housing (T13)
with separate connection compartment

Process connection:
For EEx d(e) for FTM50

R 1½
NPT 1½
NPT 1¼

* For Tri-Clamp 16 mm



L00-FTM5xxxx-06-05-xx-xx-006

Weight

Depends on type

Material

Housing:

316L, PBT, aluminium coated

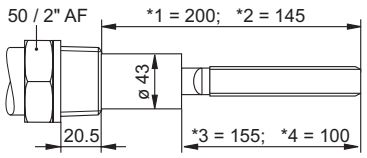
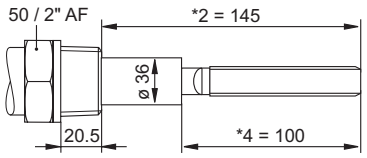
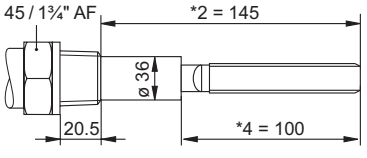
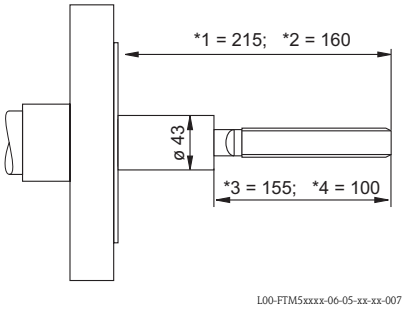
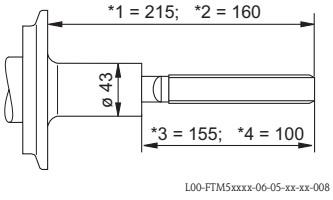
Process connections:

316L

Sensor:

316L, PUR/silicone rope insulation, PBT

Process connections

Process connection	Code	Dimensions (FTM50)	Accessories	Pressure Temperature (for FTM50/51)
NPT 1½ ANSI B 1.20.1 Sensor ø1.67" ø43 mm **R 1½** ANSI B 1.20.1	GJ GG			max. 25 bar max. 150 °C
NPT 1½ ANSI B 1.20.1 Sensor ø1.38" ø36 mm	GX			max. 25 bar max. 150 °C
NPT 1¼ ANSI B 1.20.1 Sensor ø1.38" ø36 mm	GK			max. 25 bar max. 150 °C
Flange ANSI B 16.5 EN 1092-1 (DIN 2527 B) JIS B 2238	A# B# K#		Seal according to design Installed on site In conformity with FDA*	See nominal pressure of flange, however max. 25 bar max. 150 °C
Tri-Clamp 2" = ø64.0 mm ISO 2852	TD		Clamping ring and front seal Installed on site In conformity with FDA*	max. 16 bar max. 120 °C max. 2 bar max. 150 °C
* Material in conformity with FDA as per 21 CFR Part 177.1550/2600				

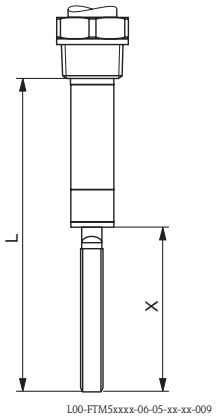
*1 overall length standard fork
*2 overall length short fork
*3 fork length standard fork
*4 fork length short fork

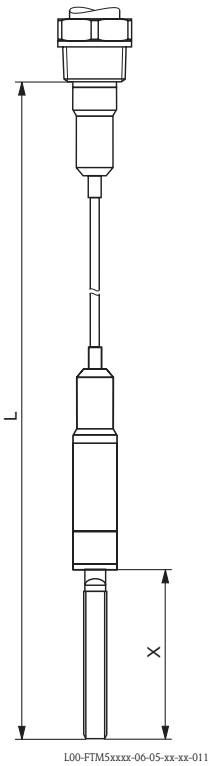
Overall length

For FTM51, depends on process connection and selected pipe extension,
for FTM52, depends on process connection and selected rope length

Thread: NPT 1½
NPT 1¼
R 1½

FTM51 **FTM52**

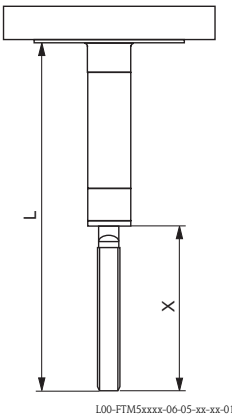


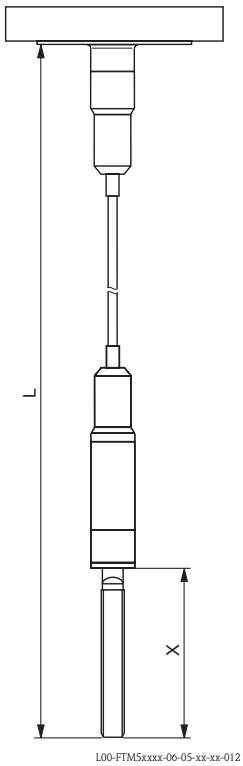


From lower edge of thread

Flange and Tri-Clamp

FTM51 **FTM52**

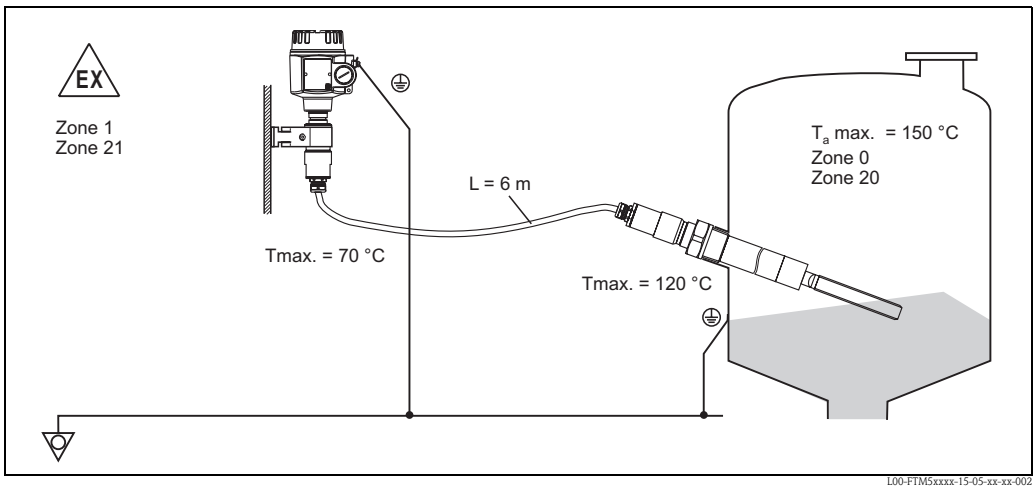




L = overall length, X = fork length

Further informations to overall length/fork length see "Measuring range" on Page 5.

Separate housing



x °C = (1.8 x + 32) °F

Application: for extended ambient temperature and applications with confined installation location (e.g. filling nozzle applications).
The cable between the separate housing and sensor can be shortened at the customer's.

Human interface

Display elements

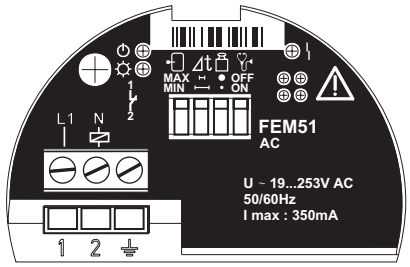
Note!
The switch settings in the following graphics are in the as-delivered state.

FEM51

A green LED lit:
Indicates operational status

A yellow LED lit:
Indicates switching status

A red LED:
flashing – indicates maintenance is required
lit – indicates device failure



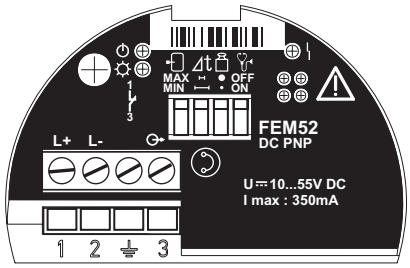
L00-FTM5xxxx-03-05-xx-xx-001

FEM52

A green LED lit:
Indicates operational status

A yellow LED lit:
Indicates switching status

A red LED:
flashing – indicates maintenance is required
lit – indicates device failure



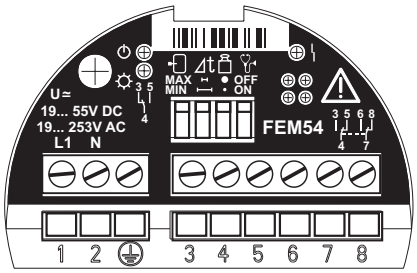
L00-FTM5xxxx-03-05-xx-xx-002

FEM54

A green LED lit:
Indicates operational status

A yellow LED lit:
Indicates switching status

A red LED:
flashing – indicates maintenance is required
lit – indicates device failure



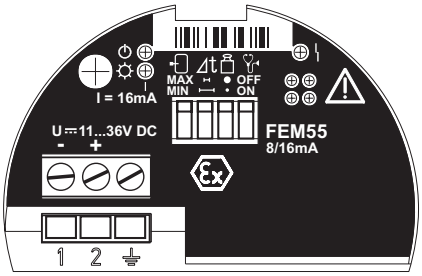
L00-FTM5xxxx-03-05-xx-xx-004

FEM55

A green LED lit:
Indicates operational status

A yellow LED lit:
Indicates switching status

A red LED:
flashing – indicates maintenance is required
lit – indicates device failure



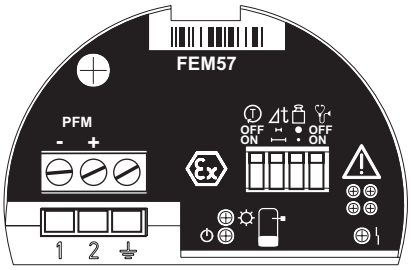
L00-FTM5xxxx-03-05-xx-xx-005

FEM57

A green LED:
Indicates operational status

A yellow LED:
Indicates covered status

A red LED:
flashing – indicates maintenance is required
lit – indicates device failure



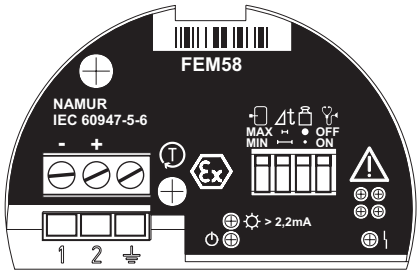
L00-FTM5xxxx-03-05-xx-xx-007

FEM58

A green LED:
flashing – indicates operational status

A yellow LED:
Indicates switching status

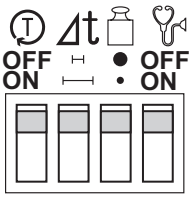
A red LED:
flashing – alternately with green LED
if maintenance is required
flashing – indicates device failure



L00-FTM5xxxx-03-05-xx-xx-008

Note!
Test button – breaks the cable connection

Operating elements of electronic inserts FEM51, FEM52, FEM54, FEM55, FEM58



(factory setting)

L00-FTM5xxxx-19-05-xx-xx-002

One switch for safety mode

MAX	Overfill protection
MIN	Dry running protection

One switch for switching delay

- ⊢ 0.5 s when covered, 1.5 s when uncovered (short fork 1 s)
- ⟝ 5 s when covered, 5 s when uncovered

One switch for bulk density/density setting

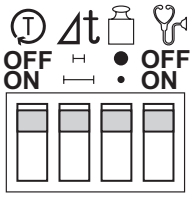
- ● 50 g/l standard fork, 200 g/l short fork (high bulk density)
- • 10 g/l standard fork, 50 g/l short fork (low bulk density)

One switch for diagnosis

OFF	Diagnosis of abrasion and build-up switched OFF.
ON	Diagnosis of abrasion and build-up switched ON.

- For additional density setting to high bulk density:
  abrasion and build-up are indicated per LED at the electronic insert only
- For additional density setting to low bulk density:
  output of "signal on alarm" for abrasion and build-up

Operating elements for FEM57 electronic insert



(factory setting)

L00-FTM5xxxx-19-05-xx-xx-002

One switch for recurrent testing

OFF Recurrent testing switched OFF
ON At the same time, switching delay 0.5 s when covered, density setting low bulk density and diagnosis ON (see also Page 12):
Perform recurrent proof test when voltage returns.

One switch for switching delay

- 0.5 s when covered, 1.5 s when uncovered (short fork 1 s)
- 5 s when covered, 5 s when uncovered

One switch for bulk density/density setting

- ● 50 g/l standard fork, 200 g/l short fork (high bulk density)
- • 10 g/l standard fork, 50 g/l short fork (low bulk density)

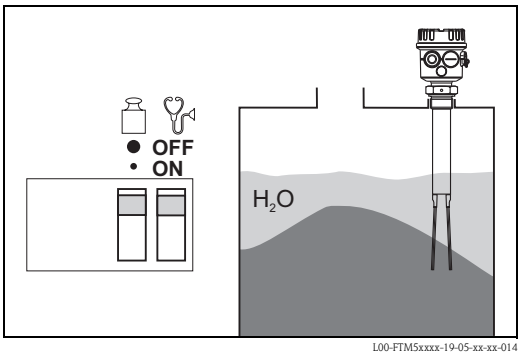
One switch for diagnosis

OFF Diagnosis of abrasion and build-up switched OFF.
ON Diagnosis of abrasion and build-up switched ON.

- For additional density setting to high bulk density:
  abrasion and build-up are indicated per LED at the electronic insert only
- For additional density setting to low bulk density:
  output of "signal on alarm" for abrasion and build-up

Sediment detection FTM50, FTM51

Detection of solids under water



L00-FTM5xxxx-19-05-xx-xx-014

With this device setting, the system only senses if the unit is actually covered by bulk solids. The system does not detect coverage by liquids similar to water.

Certificates and approvals

CE mark, declaration of conformity

The instrument is designed to meet state-of-the-art safety requirements, has been tested and left the factory in a condition in which it is safe to operate.
The instrument complies with the applicable standards and regulations as listed in the EC declaration of conformity and thus complies with the statutory requirements of the EG directives.
Endress+Hauser confirms the successful testing of the instrument by affixing to it the CE mark.

Ex approval

Your Endress+Hauser sales centre can provide you with information on the Ex versions which can currently be delivered.
All explosion protection data are given in a separate documentation (see "Supplementary documentation") which is available upon request.
Copies of certificates available upon request.

Type of protection

See "Ordering information" as of Page 25 and "Supplementary documentation" on Page 32.

Other standards and guidelines

Other standards and guidelines that were taken into consideration in designing and developing Soliphant M FTM50, FTM51, FTM52:

- Low Voltage Directive (73/23/EEC)
- DIN EN 61010 Part 1, 2001
  Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures
  Part 1: General requirements
- EN 61326
  Electrical Equipment for Measurement, Control and Laboratory Use
  EMC requirements

Ordering information

Soliphant M FTM50

10	Approval		
	A	Non-hazardous area	
	C	CSA General Purpose, CSA C US	
	D	FM DIP Cl. II, III, Div. 1+2 Group E-G + CSA DIP Cl. II, III, Div. 1+2 Group G+coal dust	
	E	FM DIP + CSA DIP Cl. II, III, Div. 1+2 Group E-G	
	F	FM IS Cl. I, II, III, Div. 1+2 Group A-G + CSA IS Cl. I, II, III, Div. 1+2 Group A-D, G+coal dust	
	G	FM IS + CSA IS Cl. I, II, III, Div.1+2 Group A-G	
	H	FM XP Cl. I, II, III, Div. 1+2 Group A-G + CSA XP Cl. I, II, III, Div. 1+2 Group A-D, G+coal dust	
	J	FM XP + CSA XP Cl. I, II, III, Div. 1+2 Group A-G	
	Y	Special version	
	1	ATEX II 1 D, II 1/2 GD, II 1/3 GD	EEx ia IIC T6
	2	ATEX II 1/2 D	
	3	ATEX II 3 D, II 3 G	EEx nA/nL/nC
	4	ATEX II 1/3 D	
	5	ATEX II 1 D, II 1/2 G	EEx de (ia) IIC T6
	6	ATEX II 1 D, II 2 G	EEx d (ia) IIC T6
	7	ATEX II 1 D, ATEX II 1 G	EEx ia IIC T6, XA -> Observe safety instructions!

20		Process connection
	AF	2", 150 LBS, RF, flange ANSI B16.5
	AG	3", 150 LBS, RF, flange ANSI B16.5
	AH	4", 150 LBS, RF, flange ANSI B16.5
	B3	DN50, PN25/40 A, flange EN1092-1 (DIN2527 B)
	BS	DN80, PN10/16 A, flange EN1092-1 (DIN2527 B)
	BT	DN100, PN10/16 A, flange EN1092-1 (DIN2527 B)
	GG	Thread DIN2999 R1½
	GJ	Thread ANSI NPT1½, d = 1.67" sensor
	GK	Thread ANSI NPT1¼, d = 1.38" sensor
	GX	Thread ANSI NPT1½, d = 1.38" sensor -> Suitable for ISA nozzles
	KF	10K 50, RF, flange JIS B2238
	KG	10K 80, RF, flange JIS B2238
	KH	10K 100, RF, flange JIS B2238
	TD	Tri-Clamp ISO2852, DN40-51 (2")
	YY	Special version

30			Material
		2	316L
		9	Special version

40				Fork; bulk density
			A	155 mm/6 inch; min. 10 g/l
			K	100 mm/4 inch; min. 50 g/l
			Y	Special version

50					Electronics; output		
					1	FEM51: 2-wire 19...253 V AC,	Probe circuit, intrinsically safe
					2	FEM52: 3-wire PNP 10...55 V DC,	Probe circuit, intrinsically safe
					4	FEM54: relay DPDT 19...253 V AC/55 V DC,	Probe circuit, intrinsically safe
					5	FEM55: 8/16 mA 11...36 V DC	
					7	FEM57: 2-wire PFM	
					8	FEM58: NAMUR + push button (H-L signal)	
					9	Special version	

60						Type of probe	
					A	Compact	
					D	6 m cable	> separate housing
					E	20 ft cable	> separate housing
					G	6 m cable, reinforced	> separate housing
					H	20 ft cable, reinforced	> separate housing
					Y	Special version	

70							**Housing**				
							H	T13, aluminium, IP66/68, NEMA4X, separate connection compartment			
							Y	Special version			
							1	F16, polyester IP66/67, NEMA4X, cover with sight glass			
							3	F17, aluminium, IP66/67, NEMA4X			
							5	F13, aluminium, IP66/68, NEMA4X			
							7	F15, 316L, IP66/67, NEMA4X			
80								**Cable entry**			
								2	M20 gland (EEx d > thread M20)		
								3	Thread, NPT½		
								4	Thread, G½		
								7	Thread, NPT¾		
								9	Special version		
90									**Additional option 1**		
									A	Not selected	
									G	Glass cover	
									Y	Special version	
100										**Additional option 2**	
										A	Not selected
										C	EN10204-3.1 material (wetted parts), inspection certificate
										Y	Special version
FTM50											Complete product designation

Soliphant M FTM51

10	Approval	
A	Non-hazardous area	
C	CSA General Purpose, CSA C US	
D	FM DIP Cl. II, III, Div. 1+2 Group E-G + CSA DIP Cl. II, III, Div. 1+2 Group G+coal dust	
E	FM DIP + CSA DIP Cl. II, III, Div. 1+2 Group E-G	
F	FM IS Cl. I, II, III, Div. 1+2 Group A-G + CSA IS Cl. I, II, III, Div. 1+2 Group A-D, G+coal dust	
G	FM IS + CSA IS Cl. I, II, III, Div.1+2 Group A-G	
H	FM XP Cl. I, II, III, Div. 1+2 Group A-G + CSA XP Cl. I, II, III, Div. 1+2 Group A-D, G+coal dust	
J	FM XP + CSA XP Cl. I, II, III, Div. 1+2 Group A-G	
Y	Special version	
1	ATEX II 1 D, II 1/2 GD, II 1/3 GD	EEx ia IIC T6
2	ATEX II 1/2 D	
3	ATEX II 3 D, II 3 G	EEx nA/nL/nC
4	ATEX II 1/3 D	
5	ATEX II 1 D, II 1/2 G	EEx de (ia) IIC T6
6	ATEX II 1 D, II 2 G	EEx d (ia) IIC T6
7	ATEX II 1 D, ATEX II 1 G	EEx ia IIC T6, XA -> Observe safety instructions!

20		Process connection
AF		2", 150 LBS, RF, flange ANSI B16.5
AG		3", 150 LBS, RF, flange ANSI B16.5
AH		4", 150 LBS, RF, flange ANSI B16.5
B3		DN50, PN25/40 A, flange EN1092-1 (DIN2527 B)
BS		DN80, PN10/16 A, flange EN1092-1 (DIN2527 B)
BT		DN100, PN10/16 A, flange EN1092-1 (DIN2527 B)
GG		Thread DIN2999 R1½
GJ		Thread ANSI NPT1½, d = 1.67" sensor -> Suitable for sliding sleeve
GK		Thread ANSI NPT1¼, d = 1.38" sensor
GX		Thread ANSI NPT1½, d = 1.38" sensor -> Suitable for ISA nozzles
KF		10K 50, RF, flange JIS B2238
KG		10K 80, RF, flange JIS B2238
KH		10K 100, RF, flange JIS B2238
TD		Tri-Clamp ISO2852, DN40-51 (2")
YY		Special version

30			Material
2			316L
9			Special version

40				Overall length; bulk density
L				... mm; min. 10 g/l
M				... mm; min. 50 g/l
P				... inch; min. 10 g/l
Q				... inch; min. 50 g/l
Y				Special version

50					Electronics; output	
1					FEM51: 2-wire 19...253 V AC,	Probe circuit, intrinsically safe
2					FEM52: 3-wire PNP 10...55 V DC,	Probe circuit, intrinsically safe
4					FEM54: relay DPDT 19...253 V AC/55 V DC,	Probe circuit, intrinsically safe
5					FEM55: 8/16 mA 11...36 V DC	
7					FEM57: 2-wire PFM	
8					FEM58: NAMUR + push button (H-L signal)	
9					Special version	

60						Type of probe	
A						Compact	
D						6 m cable	> separate housing
E						20 ft cable	> separate housing
G						6 m cable, reinforced	> separate housing
H						20 ft cable, reinforced	> separate housing
Y						Special version	

70							**Housing**				
							H	T13, aluminium, IP66/68, NEMA4X, separate connection compartment			
							Y	Special version			
							1	F16, polyester IP66/67, NEMA4X, cover with sight glass			
							3	F17, aluminium, IP66/67, NEMA4X			
							5	F13, aluminium, IP66/68, NEMA4X			
							7	F15, 316L, IP66/67, NEMA4X			
80								**Cable entry**			
								2	M20 gland (EEx d > thread M20)		
								3	Thread, NPT½		
								4	Thread, G½		
								7	Thread, NPT¾		
								9	Special version		
90									**Additional option 1**		
									A	Not selected	
									G	Glass cover	
									Y	Special version	
100										**Additional option 2**	
										A	Not selected
										C	EN10204-3.1 material (wetted parts), inspection certificate
										Y	Special version
FTM51											Complete product designation

Soliphant M FTM52

10	Approval	
A	Non-hazardous area	
C	CSA General Purpose, CSA C US	
D	FM DIP Cl. II, III, Div. 1+2 Group E-G + CSA DIP Cl. II, III, Div. 1+2 Group G+coal dust	
F	FM IS Cl. I, II, III, Div. 1+2 Group A-G + CSA IS Cl. I, II, III, Div. 1+2 Group A-D, G+coal dust	
H	FM XP Cl. I, II, III, Div. 1+2 Group A-G + CSA XP Cl. I, II, III, Div. 1+2 Group A-D, G+coal dust	
Y	Special version	
1	ATEX II 1 D, II 1/2 GD, II 1/3 GD	EEx ia IIC T6
2	ATEX II 1/2 D	
3	ATEX II 3 D, II 3 G	EEx nA/nL/nC
4	ATEX II 1/3 D	
5	ATEX II 1 D, II 2 G	EEx de (ia) IIC T6
6	ATEX II 1 D, II 2 G	EEx d (ia) IIC T6
7	ATEX II 1 D, ATEX II 1 G	EEx ia IIC T6, XA -> Observe safety instructions!

20		Process connection
AF		2", 150 LBS, RF, flange ANSI B16.5
AG		3", 150 LBS, RF, flange ANSI B16.5
AH		4", 150 LBS, RF, flange ANSI B16.5
B3		DN50, PN25/40 A, flange EN1092-1 (DIN2527 B)
BS		DN80, PN10/16 A, flange EN1092-1 (DIN2527 B)
BT		DN100, PN10/16 A, flange EN1092-1 (DIN2527 B)
GG		Thread DIN2999 R1½
GJ		Thread ANSI NPT1½, d = 1.67" sensor
GK		Thread ANSI NPT1¼, d = 1.38" sensor
GX		Thread ANSI NPT1½, d = 1.38" sensor -> Suitable for ISA nozzles
KF		10K 50, RF, flange JIS B2238
KG		10K 80, RF, flange JIS B2238
KH		10K 100, RF, flange JIS B2238
TD		Tri-Clamp ISO2852, DN40-51 (2")
YY		Special version

30			Material
2			316L
9			Special version

40				Overall length; bulk density
B				... mm; min. 10 g/l
C				... mm; min. 50 g/l
F				... inch; min. 10 g/l
G				... inch; min. 50 g/l
Y				Special version

50					Electronics; output	
1					FEM51: 2-wire 19...253 V AC,	Probe circuit, intrinsically safe
2					FEM52: 3-wire PNP 10...55 V DC,	Probe circuit, intrinsically safe
4					FEM54: relay DPDT 19...253 V AC/55 V DC,	Probe circuit, intrinsically safe
5					FEM55: 8/16 mA 11...36 V DC	
7					FEM57: 2-wire PFM	
8					FEM58: NAMUR + push button (H-L signal)	
9					Special version	

60						Type of probe	
A						Compact	
D						6 m cable	> separate housing
E						20 ft cable	> separate housing
G						6 m cable, reinforced	> separate housing
H						20 ft cable, reinforced	> separate housing
Y						Special version	

70							**Housing**				
							H	T13, aluminium, IP66/68, NEMA4X, separate connection compartment			
							Y	Special version			
							1	F16, polyester IP66/67, NEMA4X, cover with sight glass			
							3	F17, aluminium, IP66/67, NEMA4X			
							5	F13, aluminium, IP66/68, NEMA4X			
							7	F15, 316L, IP66/67, NEMA4X			
80								**Cable entry**			
								2	M20 gland (EEx d > thread M20)		
								3	Thread, NPT½		
								4	Thread, G½		
								7	Thread, NPT¾		
								9	Special version		
90									**Additional option 1**		
									A	Not selected	
									G	Glass cover	
									Y	Special version	
100										**Additional option 2**	
										A	Not selected
										Y	Special version
FTM52											Complete product designation

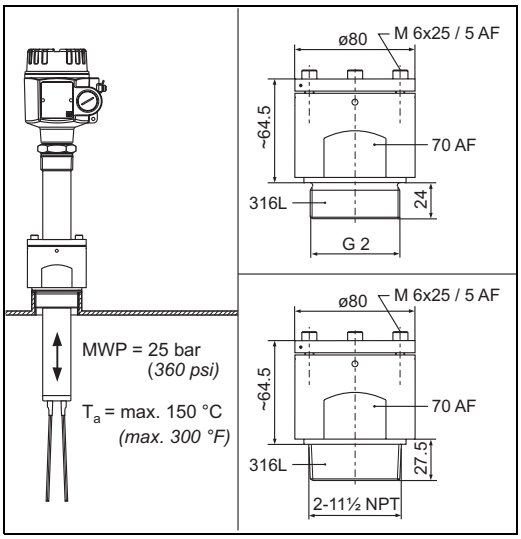
Accessories

Sliding sleeve

For pressurised container

- G 2 A
  DIN ISO 228/I
  52024631
- NPT 2 - 11½
  ANSI B 1.20.1
  52024630

Note!
Suitable for multiple switch-point configurations!



L00-FTM5xxxx-03-05-xx-en-002

Rope shortening kit

For FTM52
52024632

Spare parts

- FEM51 electronic insert
  52026497
- FEM52 electronic insert
  52026498
- FEM54 electronic insert
  52026499
- FEM55 electronic insert
  52026500
- FEM57 electronic insert
  52026501
- FEM58 electronic insert
  52026502
- Cover for polyester housing (F16), transparent plastic with seal
  52025790
- Cover for aluminium housing (F13, F17), aluminium with glass insert and seal (not for EEx d)
  52027693
- Cover for aluminium housing (F13, F17), aluminium with seal (not for EEx d)
  52002699
- Cover for aluminium housing (F13), aluminium with seal (for EEx d)
  520002698
- Cover for stainless steel housing (F15), stainless steel with seal
  52002700
- Cover for stainless steel housing (F15), stainless steel with seal (for certificates D, E, 2, 3, 4)
  52027708
- Cover for stainless steel housing (F15), stainless steel with glass insert and seal
  52027002
- Cover for stainless steel housing (F15), stainless steel with glass insert and seal (for certificates D, E, 2, 3, 4)
  52027709
- Cover for aluminium housing (T13) electronics compartment, aluminium with seal
  52006903
- Cover for aluminium housing (T13) terminal compartment, aluminium with seal
  52007103

Supplementary documentation

Operating Instructions

- Soliphant M FTM50, FTM51
  KA229F/00/a6
- Soliphant M FTM52
  KA230F/00/a6
- Soliphant M FTM51, Sliding sleeve, pressurised
  KA239F/00/a6
- Soliphant M FTM52, Rope shortening
  KA231F/00/a6

Certificates

- ATEX II 1 D, II 1/2 D, II 1 G, II 1/2 G EEx ia IIC T6
  XA305F/00/a3
- ATEX II 1 D, II 1 G EEx ia IIC T6 (X)
  XA319F/00/a3
- ATEX II 1 D, II 1/2 D, II 1/2 G, II 2 G EEx d/de (ia) IIC T6
  XA306F/00/a3
- ATEX II 1/2 D, II 1/3 D
  XA307F/00/a3
- ATEX II 3 D, II 3 G EEx nA/nL/nC
  XA331F/00/a3

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